REMARKS

The Office Action dated April 12, 2007, and the patents cited therein have been carefully reviewed, and in view of the above changes and following remarks reconsideration and allowance of all the claims pending in the application are respectfully requested.

Claims 1-20, 22-24 and 26 are pending. Claims 1, 7, 10, 15 and 20 have been amended. Claims 21 and 25 have been previously canceled.

The Amendments To The Claims

Claims 1, 7, 10, 15 and 20 have been amended to better distinguish the claimed subject matter over the applied art. In particular, each of claims 1, 7, 10, 15 and 20 have been amended to now include the concept of a log record containing information describing modifications to the page of the database for a corresponding data record write, and to include the concept of asynchronously remotely copying each data record write having a sequential identification that is only prior to or equal to the sequential identification of the log record write corresponding to a received acknowledgement. Support for the amendments to claims 1, 7, 10, 15 and 20 can be found throughout the specification, for example, at least at in paragraphs [15]-[22] and in Figures 2-4 of the originally filed patent application.

Applicant respectfully notes that the previously added claim language that is now at issue has been removed. Because the removal of the language at issue is related to a rejection based on formal grounds, and because Applicant respectfully believes that the language at issue is now not necessary for distinguishing the claimed subject matter over the applied art, the addition and removal of the language at issue causes no narrowing of the claims and no prosecution history results from the addition and removal of the language at issue.

The Rejection Under 35 U.S.C. § 112, First Paragraph

Claims 1, 7, 10, 15 and 20 stand rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. More specifically, the Examiner asserts that "[s]pecifically, claims 1, 7, 10, 15 and 20, recite the limitation "… having a

sequential identification that is prior to or equal to <u>and not later than</u> the sequential identification ...", which is not supported within the specification thereby rendering a written description/new matter rejection." Further, the Examiner states that the "examiner is unsure why the addition of 'and not later than' was incorporated and where within the specification this is supported."

As for the Examiner's assertion regarding the lack of support within the specification, Application respectfully submits that support for the language added to claims 1, 7, 10, 15 and 20 in the last Amendment and the language added to claims 1, 7, 10, 15 and 20 in the current Amendment can be found at least in paragraphs [15]-[22] and in Figures 2-4 of the originally filed patent application. In particular, paragraph [15] of the originally filed patent application discloses that an ideal approach for a remote copy for an application, such as a database, would be to perform a remote copy of log records in an asynchronous FIFO order and for each data record, keep information about the log volume relating to the data record. Once a log record has been copied remotely, all data records that were constrained by the remotely copied log records can be remotely copied. Thus, the invariant desired by certain databases is maintained, while ensuring that the log volume does not incur the overhead of a synchronous remote copy. The claimed subject matter, which achieves the ideal approach, is supported by the disclosure of paragraphs [16]-[22] of the originally filed patent application. That is, the claimed subject matter achieves asynchronously remotely copying each data record write having a sequential identification that is only prior to or equal to the sequential identification of the claimed log record write corresponding to the received acknowledgement. (See, for example, claim 1.)

Further, it is respectfully noted that Figure 2 sets forth an exemplary flowchart that achieves the ideal approach set forth in paragraph [15] of the originally filed patent application. In fact, it is respectfully submitted that step 207 of Figure 2 depicts sending data records only having a Log Sequence Number (LSN) $\leq L_{min}$ to a remote site. Further still, it is respectfully noted that Figure 4 also depicts the claimed subject matter of both of the previous and current Amendments.

Regarding the Examiner's uncertainty as to why the language at issue was added to claims 1, 7, 10, 15 and 20, Applicant respectfully submits that the language at issue was amended into claims 1, 7, 10, 15 and 20 "to better distinguish the claimed subject matter over the applied art." (See Request For Continued Examination And Amendment In Response To Final Rejection submitted February 5, 2007, page 8, lines 8-9.) That is, the particular language amended into claims 1, 7, 10, 15 and 20 was selected in an attempt to affirmatively add a limitation to the claimed subject matter that distinguished over the applied art because Applicant believed (and still believes) that the applied art does not provide the language at issue.

As a final note, Applicant respectfully submits that one of skill in the art, for whom the specification of the present patent application was written, would understand that paragraphs [15]-[22] and Figures 2-4 support the claimed subject matter of both the previous and the current Amendments.

Consequently, Applicant respectfully requests that the Examiner withdraw this rejection.

The Rejection Under 35 U.S.C. § 112, Second Paragraph

Claims 1, 7, 10, 15 and 20 stand rejected under 35 U.S.C. § 112, second paragraph, as indefinite for failing to particularly point out and distinctly claim the subject matter regarded as the invention.

In view of the currently amendments to claims 1, 7, 10, 15 and 20, the discussion above relating to the rejection based on 35 U.S.C. § 112, first paragraph, and the discussion below relating to the rejection based on Yanai et al. in view of Shomler et al., Applicant respectfully requests that the Examiner withdraw this rejection.

The Rejection Under 35 U.S.C. § 103(a) Over Yanai In View of Shomler

Claims 1-24 and 26 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Yanai et al. (Yanai), U.S. Patent No. 6,502,205 B1, in view of Shomler, U.S. Patent No. 5,623,599.

Applicant respectfully traverses this rejection. Applicant respectfully submits that the subject matter according to any of claims 1-20, 22-24 and 26 is patentable over Yanai in view of

Shomler. Applicant respectfully submits that even if the applied patents are properly combinable, the method and system resulting from the combination of Yanai and Shomler is not the claimed subject matter.

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations.

The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in Applicant's disclosure. See *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). (See, also, MPEP §§ 706.02(j) and 2143).

Regarding the third basic criteria for establishing a *prima facie* case of obviousness with respect to claim 1, neither Yanai nor Shomler disclose or suggest a method comprising at least asynchronously remotely copying each data record write having a sequential identification that is only prior to or equal to the sequential identification of the log record write corresponding to the received acknowledgement.

The Examiner still admits that Yanai is silent regarding most of claim 1. (See Office Action dated April 12, 2007, page 7, lines 3-10.) Applicant respectfully submits that the portions of Shomler cited by the Examiner with respect to claim 1 are taken out of context by the Examiner and, when considered in the true context of the disclosure of Shomler, it is plain that the cited portions are not the subject matter of claim 1.

More specifically, the portions of Shomler cited by the Examiner relate to an improvement to an asynchronous copy operation system disclosed in U.S. Patent Application Serial No. 07/992,219 (now U.S. Patent No. 5,577,222 to Micka et al.). The Micka et al. system

is disclosed by Shomler to use a sequence checkpoint for maintaining sequence integrity with asynchronous information packet presentation. According to Shomler, the Micka et al. system uses a set of information packets that are grouped together and processed as a single sequence unit. Shomler discloses that the Micka et al. sequence unit, i.e., the group of information packets, is interpreted and processed as though all or none of the writes in the group have occurred. (See Shomler, column 7, lines 22-38, and column 9, lines 33-35.) The checkpoint group of information packets is assigned a checkpoint sequence number and sent to a secondary process location where all the data updates represented in the checkpoint group are treated as a single unit for sequence integrity. According to Shomler, changed data for all the information packets must be received before any data for an information packet in the group is written to a secondary DASD (Direct Access Storage Device) copy. (See Shomler, column 8, lines 1-9.) Thus, Shomler discloses that the Micka et al. system allows for a situation in which the information packets forming a group might not be complete and written as a secondary DASD copy before a subsequently queued group of information packets is complete and written as a secondary DASD copy.

Shomler further discloses a situation in which there might be some transactions that are so important that the transactions must be communicated before the total number of transactions within a sequence checkpoint (i.e., a group) is complete. (See Shomler, column 8, lines 16-19.) Shomler demonstrates that for the Micka et al. system the overall flow of the (asynchronous) transactions would be disrupted for such a situation in which important transaction must be communicated before the total number of transactions within a sequence checkpoint is complete. (See Shomler, column 8, line 33, through column 9, line 5.)

Shomler purports to provide an improvement to the asynchronous copy operation system of Micka et al. by providing a synchronizing marker system for communicating important transactions before the total number of transactions within a sequence checkpoint is communicated without disrupting the overall flow of the transactions in the system. (See Shomler, column 9, lines 6-8, and column 11, lines 27-30.) It is this improvement by Shomler

and an alternative embodiment of the Shomler system on which the Examiner relies as a basis for the rejection of claim 1.

According to Shomler, an application process 12' in the Shomler system creates a marker request event 4a upon the completion of a local write operation 4. The marker request event 4a is signaled to copy process 16'. It should be noted that marker request event 4a is disclosed to be subsequent to (a) application process 12' performing an I/O write to DASD subsystem 14' (indicated at 2 in Shomler Figure 5), (b) DASD subsystem 14' sending a message token to the copy process 16' in response to recognizing that a write to a storage area that is to be copied is about to be performed (indicated at 3 (and 5) in Shomler Figure 5, and (c) completion of the process application's I/O write operation (indicated at 4 in Shomler Figure 5). Copy process 16' arranges the message token received at 5 in the correct sequence relative to other copy events in the system. (See Shomler, column 9, lines 18-25.)

In response to marker request event 4a, copy process 16' creates a marker message token and inserts the marker message token into the message stream that is moved to secondary subsystem 18' (indicated at 6 in Shomler Figure 5). At secondary subsystem 18', the message marker token is recorded into the control info log and pending write queue in the same manner as other message tokens (indicated at 4b in Shomler Figure 5). (See Shomler, column 9, lines 26-32.) When the group (recall the Micka et al. sequence unit of grouped information packets) that encompasses the marker synchronize request is complete and ready to the written to the secondary DASD subsystem, the secondary remote copy data mover returns an acknowledgement to the primary subsystem that the marker operation is complete, that is, that the secondary subsystem has secured all the secondary write data that is preceded by the marker.

Figure 6 of Shomler shows an exemplary pending write queue at a secondary subsystem 18' depicting a synchronizing MARKER TOKEN 126 in a pending write queue. Notably, Figure 6 shows DATA BEING MARKED 122 inserted in the pending write queue prior to the point in which synchronizing MARKER TOKEN 126 has been inserted into the queue. Shomler indicates that the marker synchronize request (i.e., MARKER TOKEN 126) causes no secondary DASD copy write. (See Shomler, column 9, line 67, through column 10, line 1.) In fact, a

message MARKER TOKEN 126 that is inserted into the pending write queue <u>has no corresponding update write data, and will necessarily have a later time stamp and higher global event sequence number than tokens for any preceding I/O write operation</u>. (See Shomler, column 9, lines 51-58, emphasis added.)

Other notable items depicted in Figure 6 of Shomler include (a) a depiction of UPDATED DATA in the pending queue as shaded blocks, and (b) some later-in-time UPDATED DATA in the pending queue before some earlier-in-time UPDATED DATA. (See Shomler, column 10, lines 1-8.) Thus, no indication of UPDATED DATA by a shaded block indicates that no UPDATED DATA has yet been received and inserted into the pending queue. Recalling that the Micka et al. system contemplates a situation in which the information packets forming a group containing a marker token might not be complete before a subsequently queue group of information packets is complete, Figure 6 confirms that the Shomler system also contemplates such a similar situation. That is, Shomler contemplates a situation in which information packets forming a group and containing a marker token might not be complete and written as a secondary DASD copy before a subsequently queued group of information packets (group) is complete and written as a secondary DASD copy. As disclosed by Shomler, an incomplete group will accordingly not be processed until the group is complete even though the group might contain a marker token. (See Shomler, column 8, lines 1-9.)

Thus, when Shomler is not taken out of context, it is plain that Shomler MARKER TOKEN 126 is not the claimed log record write of claim 1 because MARKER TOKEN 126 does not contain information describing to modifications to the page of the database for a corresponding data record write. (See Shomler, column 9, lines 51-58, and column 9, line 67, through column 10, line 1.) Moreover, it is plain that the Examiner's characterization of the operation of Shomler is without basis because Shomler does not disclose or suggest asynchronously remotely copying each data record write having a sequential identification that is only prior to or equal to the sequential identification of the claimed log record write corresponding to the received acknowledgement because, (a) as demonstrated above, the Shomler MARKER TOKEN 126 is not the claimed log record write, and (b) as demonstrated in

connection with Figure 6, Shomler contemplates a situation in which information packets forming a group and containing a marker token might not be complete and written as a secondary DASD copy before a subsequently queued group of information packets is complete and written as a secondary DASD copy.

Turning now to the Examiner's assertions and analysis, the Examiner asserts that column 9, lines 33-39, of Shomler discloses the claimed "receiving an acknowledgement at the primary site, the acknowledgement corresponding to a log record write that has been completed at the remote site" of claim 1. Column 9, lines 33-39 of Shomler in particular discloses:

> When all of the data up to the point of the marker in the pending write queue ("A" in Fig. 6) has been secured, either in control info log (8) or on secondary copy DASD (9), the secondary copy process, identified as "Data Mover" in the figures, creates an acknowledgement message referencing the specific marker message token, and returns that message to the primary copy process 16' (10)."

Thus, at this point of the Examiner's analysis of the subject matter of claim 1, the portion of the Shomler system on which the Examiner relies utilizes a message marker token that has no corresponding update write data. (See Shomler, column 9, lines 51-58.) As already demonstrated, the Shomler message marker token is not the claimed log record write. Further, it is noted that the Examiner's analysis of the claimed subject matter of claim 1 at this point is based on the information packet grouping context of both the Micka et al. system and the Shomler system. That is, the Shomler system on which the Examiner relies for this limitation of claim 1 operates on groups of information packets that are interpreted and processed as though all or none of the writes in a group have occurred. Accordingly, the Examiner is citing as relevant to claim 1 a portion of Shomler that contemplates a situation in which information packets forming a group and containing a marker token might not be complete and written as a secondary DASD copy before a subsequently queued group of information packets (group) is

complete and written as a secondary DASD copy. As disclosed by Shomler, an incomplete group will accordingly not be processed until the group is complete even though the group might contain a marker token. Accordingly, the Shomler message marker token will necessarily have a later time stamp and higher global event sequence number than tokens for any preceding I/O write operation. (See Shomler, column 9, lines 51-58.)

Keeping in mind the context of Shomler that underlies the basis of the Examiner's first noted assertion (immediately above), Applicant respectfully submits that it appears that this context of Shomler is completely ignored in the Examiner's continued analysis of claim 1 when the Examiner interprets column 10, lines 34-45, of Shomler. More specifically, the context of information packets being processed as a group appears to be completely ignored in the continued analysis of claim 1.

As support for Applicant's premise that the context of Shomler is being ignored, Applicant respectfully submits that column 10, lines 34-45 of Shomler relates to an alternative embodiment of Shomler that uses a data mover at the primary site and the secondary site that operates in a single system. In particular, column 10, lines 16-63, of Shomler discloses:

> The preceding has been described in terms of two processing systems, one at a local or source site and the other at a remote site that contains the DASD copies. For some remote copy configurations, systems at both locations are not needed: The data mover (and sequencer) program at the local/primary and data mover program at the remote/secondary may operate in a single system. The only requirements for such operation are that the system running these programs be able to attach to the DASD subsystems at both the primary and secondary locations, which connection is quite within the capability of contemporary channels (e.g., IBM's ESCON channels, ANSI Fiber channel).
>
> When the systems operate in a single system, the (VTAM) inter-system communications described take place via passing of message and data buffers through that system's memory. An alternate system for data mover program

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sequence marker processing in which no explicit marker message needs to be exchanged between primary and secondary is described below. In this system, the remote copy system described may, as part of its normal operation, cause the secondary to send periodic and regular acknowledgement messages (ACKN) to the primary.

These ACKNs identify the event number (sequence or clock time) for data and messages received from the primary, with each ACKN informing the primary that all events up to and including the event number given have been secured at the secondary. Such a stream of ACKN messages from a communications recipient (secondary) to a sender (primary) is usual and conventional in asynchronous telecommunications protocols. These permit the sender to discard buffers that might have been needed for the resending of data and messages had they been lost in the transmission sequences.

When the remote data duplexing programs operate with an ACKN stream as described above, the process remote data copy process Synchronizing Marker of the present invention can be streamlined such that no explicit sync marker token/event communication is required between the primary and secondary data mover programs. Essentially, when a synchronizing event is called for by an application process, the primary data mover program creates its control object (as before) then monitors event number values returned in ACKN stream from the secondary. When an event number value in an ACKN is equal to or greater than the event number value of the synchronizing marker control object, the data mover program posts the control object 'complete' upon receiving the sync complete message from the secondary.

Thus, when the primary data mover program of this alternative embodiment of the Shomler system creates a control object and then monitors event number values returned in the ACKN stream from the secondary, the control object will necessarily have a later time stamp and

higher global event sequence number than tokens for any preceding I/O write operation. (See Shomler, column 9, lines 51-58.) This must be the case because Shomler discloses that the control object is created "as before". (See Shomler, column 10, lines 54-58.) Accordingly, an ACKN corresponding to a control object, which has been created "as before", will necessarily include an acknowledgment of a data record write that is subsequent in time to the claimed log record write, which is plainly not the subject matter of claim 1.

If the context of information packets being processed as a group is, in actuality, part of and underlying the Examiner's interpretation, then, as already demonstrated, Shomler does not disclose or suggest asynchronously remotely copying each data record write having a sequential identification that is only prior to or equal to the sequential identification of the claimed log record write corresponding to the received acknowledgement because the Shomler message marker token will necessarily have a later time stamp and higher global event sequence number than tokens for any preceding I/O write operation. (See Shomler, column 9, lines 51-58.) If, on the other hand, the Examiner believes that the actual context of Shomler is not being ignored, then Applicant respectfully invites the Examiner to explain with particularity in the next Office Action how the underlying context of the Shomler system is not being ignored. Applicant will respectfully interpret an absence of such an explanation as an admission that the true context underlying Shomler is being ignored.

Thus, Applicant respectfully submits that claim 1 is allowable over Yanai in view of Shomler. It follows that claims 2-6, which each incorporate the limitations of claim 1, are allowable over Yanai in view of Shomler for at least the same reasons that claim 1 is considered allowable.

Regarding claim 7, Applicant respectfully submits that the subject matter of claim 7 is allowable over Yanai in view of Shomler for reasons that are similar to the reasons that claim 1 is allowable over Yanai in view of Shomler. It follows that claims 8 and 9, which incorporate the limitations of claim 7, are each allowable over Yanai in view of Shomler for at least the same reasons that claim 7 is considered allowable.

Regarding claim 10, Applicant respectfully submits that the subject matter of claim 10 is

allowable over Yanai in view of Shomler for reasons that are similar to the reasons that claim 1 is allowable over Yanai in view of Shomler. It follows that claims 11-14, which each incorporate the limitations of claim 10, are each allowable over Yanai in view of Shomler for at least the same reasons that claim 10 is considered allowable.

Regarding claim 15, Applicant respectfully submits that the subject matter of claim 15 is allowable over Yanai in view of Shomler for reasons that are similar to the reasons that claim 1 is allowable over Yanai in view of Shomler. It follows that claims 16-19, which each incorporate the limitations of claim 15, are each allowable over Yanai in view of Shomler for at least the same reasons that claim 15 is considered allowable.

Regarding claim 20, Applicant respectfully submits that the subject matter of claim 20 is allowable over Yanai in view of Shomler for reasons that are similar to the reasons that claim 1 is allowable over Yanai in view of Shomler. It follows that claims 22-24 and 26, which each incorporate the limitations of claim 20, are each allowable over Yanai in view of Shomler for at least the same reasons that claim 20 is considered allowable.

Thus, Applicant respectfully submits that it is only by impermissible hindsight that the Examiner is able to reject claims 1-20, 22-24 and 26 based on the proffered combination of Yanai and Shomler. The method and the device resulting from the proffered combination is simply not the claimed subject matter. It is only by Applicant's disclosure that the Examiner can attempt to select particular features of Yanai and Shomler while ignoring other features to make the rejection.

Consequently, Applicant respectfully requests that the Examiner withdraw this rejection and allow claims 1-20, 22-24 and 26.
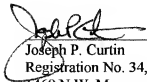
CONCLUSION

In view of the above amendments and arguments which present the claims in better form for consideration on appeal, it is urged that the present application is now in condition for allowance. Should the Examiner find that a telephonic or personal interview would expedite

passage to issue of the present application, the Examiner is encouraged to contact the undersigned attorney at the telephone number indicated below.

It is requested that this application be passed to issue with claims 1-20, 22-24 and 26.

Respectfully submitted,

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